

# Bently Nevada Systems Engineering & Services (BNSES) – Asset care services for your protection and management systems, and *all* your machinery



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**W**hen customers think of Bently Nevada services, many things come to mind. Superior services delivered by local people worldwide is one compliment we often hear.

In their Readers' Choice Awards this year, Control Magazine awarded us first place in their Vibration Instrumentation category by a wide margin, as they have done every year since the category was listed. Seventy-seven percent of respondents voted for Bently Nevada, which prompted Control Magazine to comment, "Strong first place ranks continue to hold for Bently Nevada ...." To learn more, go to <http://www.controlmagazine.com>.

When mentioning specific services, customers are usually familiar with our Product Service group for troubleshooting Bently Nevada hardware and software, and Machinery Diagnostic Services for troubleshooting and finding the fundamental causes of machinery problems. Some have used Design & Installation Services to design in, install, and set up Bently Nevada transducers and monitors. More recently, we have advertised our System Integration Engineering capabilities, which allow us to integrate machinery protection and management systems with your control, maintenance, management, and financial information systems.

## Bently Nevada Systems Engineering & Services

Bently Nevada has integrated all of its services into a cohesive engineering services organization in order to provide excellent care of our customers by improving their ability to manage assets. BNSES is not just a corporate-based support organization. It is an integration of all of Bently Nevada's service resources. It combines the strengths of

corporate knowledge and expertise with the local knowledge of your business and machinery needs. A typical project team includes: local service engineers, project engineers located near construction engineering firms, applications engineers working closely with major machinery manufacturers, support engineers for system integration and cabinet design, and a project manager. The project manager may come from a local or regional Bently Nevada office.

It is becoming more common to have the end-user, construction engineering company, and machinery manufacturers located on different continents. We are experienced with projects that need engineering resources on a global scale.

We have an excellent relationship with machinery original equipment manufacturers (OEMs) and prefer to work closely with them in engineering a machinery protection and management solution that provides the best long-term value to the user.

## Asset Optimization Process

Asset Optimization is the ability to maximize asset availability and performance at the least cost, providing the lowest Total Cost of Ownership (TCO). Global competition is intense in all industries. Even the once-conservative power generation and distribution industry has been transformed into an aggressive, competitive business in many countries. Optimizing plant operations on process alone will no longer

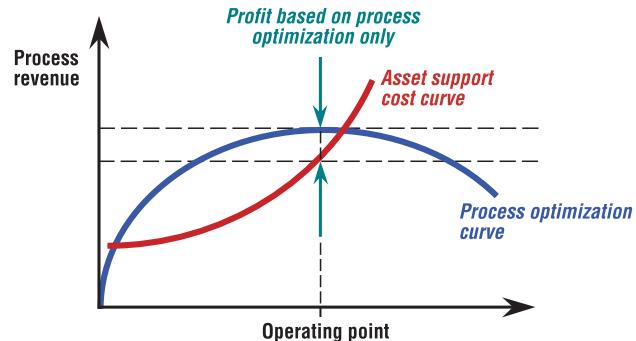
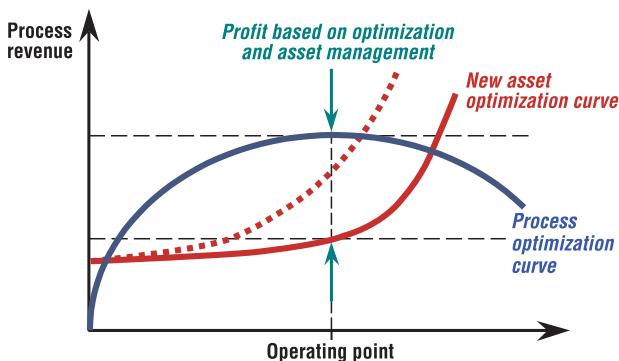


Figure 1. Optimization model based on process and asset information.

provide sufficient profits to maintain a competitive edge. Asset operation and maintenance must be optimized and integrated with process optimization. Many are aware of the cost of assets but don't have the tools or knowledge to optimize them without sacrificing process revenues.

The major return on investment in assets is in machinery. Bently Nevada has the resources and experience to apply the right hardware, software, and engineering support to allow you to maximize machinery availability and performance at lower life-cycle costs. We can help you move your "asset optimization curve" so you can optimize process revenues and asset costs to maximize your profitability.



**Figure 2. Optimized process and asset management.**

To do this, we employ a 5-step process as follows:

1. Identify the assets that provide the highest return.
2. Determine which protection and management systems should be applied.
3. Engineer those systems into your plant.
4. Implement the system.
5. Work closely with you to optimize the assets through best practices.

#### Step 1. Asset Evaluation/Risk Assessment

We first determine which machinery assets are the highest risk to your business. This will allow you to immediately begin improving protection and asset management for these critical machines, while planning a program for all your machinery.

Assets can be evaluated many ways. Assets pose a major cost to business in two ways: (1) potential loss to production (business loss costs), and (2) asset costs (operation, maintenance, and replacement). Any asset that poses high potential losses to production and high asset costs is obviously highly critical. The criticality of many assets is subtler and often changing, based on business conditions.

BNSES will work with your plant personnel to evaluate

selected machinery or all your machinery. Using a machine survey as a starting point, we'll evaluate the potential production loss, based on the machine's reliability, output, and effect on quality. We'll also look at operating, maintenance, and

## Condition Assessment

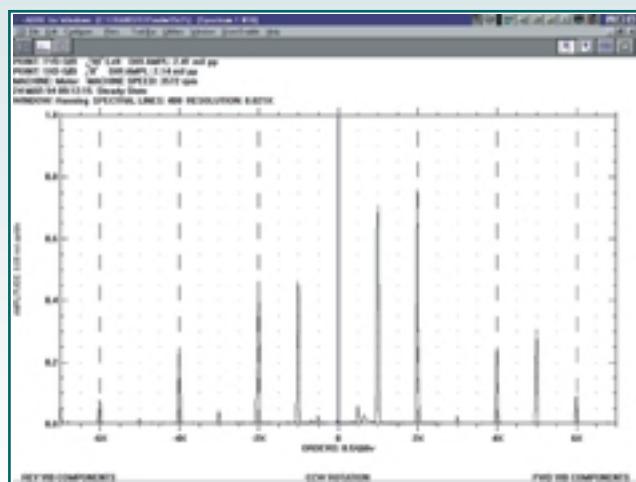
The design and installation of a complete protection and management system can take months. The condition of highly-critical machinery should be assessed immediately, to help you avoid damage, failures, and unexpected shutdowns, even before a protection and management system is installed.

Our experienced diagnostic engineers can provide this condition assessment service by visiting your site to evaluate machinery condition.

Using your permanently-installed transducers and additional temporarily-mounted transducers, we will set up ADRE® for Windows® portable diagnostic systems to collect and reduce data. We'll then provide a detailed analysis on-site along with our recommendations.

You will receive a comprehensive engineering report that serves as a condition benchmark for your machines.

Our engineers use best practices diagnostic methodology, using vibration amplitude, phase lag angle, form, position, frequency (both full and half-spectrum), machine parameters, process, and other data. Data is collected simultaneously and can be used for correlation. ☺



**Typical Full Spectrum plot.**

replacement costs. Based on this information, we'll identify those machines that pose the highest risks to your business and/or the highest possible return on investment.

You can use this report to prepare your own asset care plan, proceed with us to the next step, or use the report to request proposals for asset care plans. We recommend that you do a condition evaluation for all your high-risk critical machines, no matter what your decision is on the asset care plan.

## Rotor Modeling

An additional evaluation service is rotor modeling. Please see our article on page 42. We use proprietary Bently Nevada software to model the stiffness and damping characteristics of the rotor and its support system. This technique, unique to Bently Nevada, allows us to use live data to modify the model, so the model truly represents your machine and is not a generic, theoretical model. If necessary, we can reduce vibration through balancing, alignment, and other techniques. ☺

### Step 2. Asset Care Plan

After evaluating the criticality of your machinery, the next step is to provide engineering recommendations on how to reduce risk, using protection and management systems to form a complete asset care plan. If all your machinery wasn't evaluated in a previous step, we can do it now.

Based on our 45 years of experience and over 5000 machinery case histories, we'll provide a preliminary design for transducer, monitor, and software systems to meet best practices, industry requirements, and your specific needs.

Whenever possible, we will work closely with the machinery OEM to combine our expertise in machinery protection and

management with their machinery design expertise and operating and maintenance experience. The ideal team is made up of BNSES, the machinery OEM, and the end-user.

The preliminary design package includes: transducer selection by type, transducer location for best signal properties, monitor type for optimum protection, a protection strategy including suggested Alert and Danger levels, software recommendations, and top-level software configuration information. We will recommend supporting technologies (oil analysis, thermography, borescoping, and so on) if applicable.

Designs must be practical, balancing protection and asset management with cost considerations. We will work with you to determine return on investment (ROI), based on your accounting procedures. We will include the cost-benefit analysis and the implementation plan you will need for budgetary planning. You can use this design to engineer the detailed design yourself, use BNSES to proceed, or use the design to seek bids from other qualified engineering companies.

### Step 3. Asset Care Design

You can start with this step. In that case, we will perform all the previous steps, but we'll go directly into detailed design rather than provide an interim preliminary design package. Design takes the plan to the next step – engineering design of the system. This includes both the *system integration* of the Bently Nevada protection and management system with your control system, information system, and financial management system, and the *mechanical design* for transducer mounting, cable routing, cabinets, and other needs.

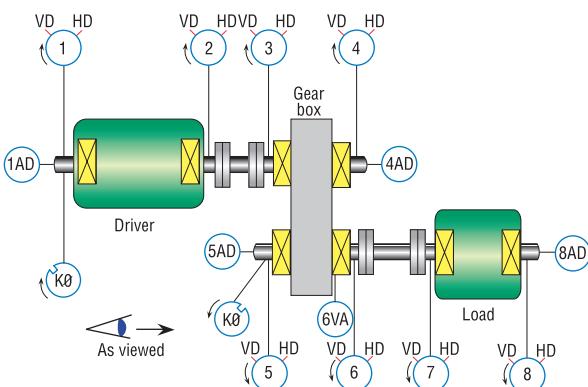
The detailed engineering design includes drawings for transducer installation with all components defined by part number, bracket and support designs, monitor installation and cabinet designs, cable routing, system integration design, and first level software configuration information.

BNSES will provide complete drawings and bills of material, including part numbers, quantity, and lead times. You can implement the design yourself, or get the best value by allowing us to implement the design. We have 45 years of experience with our systems, it's our core business – and we are confident that we can provide the most cost-effective implementation of a reliable working system when you need it.

### Step 4. Project Implementation

We have the project engineering and on-site service resources with the experience to make implementation stress-free, on-time, and for a fixed price.

In the 1990s alone, we have managed implementation



**Figure 3. Probe designation.**

projects worth more than USD 25 million. We are experienced in project implementation around the world. Recent projects have been completed in Borneo, India, Saudi Arabia, Slovenia, Thailand, Canada, and the United States. We have permanent offices in most countries, speak the local language, and are familiar with local operating and business conditions. Our local service engineers participate in the engineering of the project, and they are there to support you after the project is completed.

The implementation of a protection and management system may only be a small part of your project and may seem simple by comparison to machinery and control system installation. However, the detail needed to properly install a system is quite extensive and the pitfalls many. We are intimately familiar with the details and have learned to avoid the pitfalls. Part of all our project deliverables is a set of accurate as-built drawings (hard copies and/or electronic formats) that you can use for future reference.

#### **Step 5. Asset Care Optimization**

All Bently Nevada protection and management systems provide good value and a good return on investment as installed and configured. However, the best value is returned when the systems are optimized, based on operating experience. Your new Bently system will collect more data at a higher resolution and rate, giving you better visibility of machine condition and stress correlated with your process.

Let experienced BNSES engineers optimize your system. This ranges from adjusting Alert and Danger setpoints to better protect your machines, while minimizing false alerts and trips, to implementing customized rules sets in your Decision Support<sup>SM</sup> software. It may mean routing additional information to your control or maintenance management system or adding data points to your machinery management system. This service is normally done after startup of a new system or after an existing system has been in operation for a short period of time. We can also “dial in” on a regular basis using remote access to check your system. We will make sure you’re getting the best Actionable Information<sup>SM</sup> to support your operating and maintenance decisions.

#### **Services**

Bently Nevada believes the best value to you, our customers, is when you let us engineer the system from inception to optimization and let us provide follow-up support. That includes both “green field” projects and retrofits of existing plants. However, we recognize that you may have unique needs that force you to select individual BNSES services at

your convenience. We will continue to offer a “menu” of services in addition to providing full asset care plans.

Our current stand-alone service offerings include:

#### ***System Management***

Your protection and management system is a big investment. You can only get a good return on investment if it’s operating correctly and providing you with accurate information.

All of our products are of high quality and come with a warranty. However, the value of all the “parts” is only achieved when the entire system is functioning correctly. That system includes the transducers, monitors, data acquisition processors, workstations and software, and the data paths to and from your control, information, maintenance management, and financial management systems.

Let experienced BNSES engineers take care of your system. This care includes:

- Inspection and routine system verification.
- Maintenance (if needed).
- Replacement (if required).
- Upgrades of hardware and software to the latest configuration.
- Changes to your configuration when machinery is modified.
- Regular system optimization to optimize data collection and transfer.

We can manage spare parts for all your Bently Nevada hardware products. We will assure that you always have the latest spares when you need them without the need for a large on-site inventory. Our ability to make sure your products are up-to-date applies to software too. Bently Nevada provides regular upgrades for all software and our asset care specialists can install those upgrades, assuring that your configuration is up-to-date and optimized.

#### ***Bently Nevada Machinery Management***

Business is changing. Many of our customers want their skilled engineers to spend more time with their core business instead of machinery problems. In many cases, plant machinery engineers are spending so much time on a few “bad actors” that they don’t have time to manage all the machines or even time to set up a machinery management system. Sometimes there are so many machines that customers don’t have time to get to the fundamental cause and find themselves fighting the same old problems.

BNSES's experienced machinery management engineers can supplement your engineers or take on full responsibility for providing you with the Actionable Information<sup>SM</sup> you need to operate and maintain your machinery and optimize its performance. We supplement online information with offline (walk-around) data collection that includes vibration, oil analysis, thermography, and borescope inspections wherever appropriate. We can provide full-time support on-site, on-call support, or remote support to meet your unique needs.

Again, the ideal team for machinery management includes BNSES, the machinery OEM, and the end-user (operators, maintenance, engineering, and management people). The user's preference is key. Your preference may be to use the OEM as your lead for machinery management while BNSES acts as a consultant to the OEM as needed. This works well when managing high-risk, critical machines from the same OEM. However, in many cases, there are many different machinery OEMs, and the best approach is to use BNSES as the prime provider with the machinery OEM's available, as needed, for consulting.

### ***System Integration***

Most systems (protection, machinery management, control, information, maintenance management, financial, and others) provide the most value when they are integrated to provide a single view into your business.

These systems are made up of hardware (computers, routers, communications processors, adapters, cables, connectors, etc.) and software (applications, databases, drivers, protocols, etc.). All the pieces are relatively simple and reliable. However, they are rarely simple to integrate. BNSES has system integration engineering experience integrating Bently Nevada systems with control systems, databases, information networks, and applications such as computerized maintenance management systems (CMMSS) and enterprise resource planning (ERP) systems. If you are considering a Bently Nevada system as part of a major project, let BNSES engineer the system integration for you.

### ***Bently Nevada Machinery Diagnostics (Vibration and Performance)***

We started machinery services with machinery diagnostics engineering. It is still, and always will be, a key Bently Nevada core competency. We prefer a more proactive approach, such as online machinery management, but recognize that there will always be a place for emergency

support for problem machines. BNSES engineers can access your online system remotely and provide you with support in minutes. We are ready to be on-site anywhere in the world within 24 hours of your call. We are prepared to deal with the normal problems of balance and alignment, but we will also check your machinery for all faults at the same time. Our goal is always to get to fundamental cause and provide you with the recommendations you need to solve your machinery problems.

BNSES machinery diagnostics engineers are an industry-respected third-party reviewer for machinery protection and diagnostics. They can provide machine design review support for new machine designs and redesigns. They can provide both factory acceptance testing (FAT) and site acceptance testing (SAT) in accordance with industry standards.

Often, problems require in-depth research to determine fundamental causes and solutions. Our global machinery diagnostics service is supported by the Bently Rotor Dynamics Research Corporation, a world-class rotor dynamics research laboratory well-known for practical research on shaft cracks, fluid-induced instabilities, dynamic stiffness, perturbation testing, rotating stall, and other key areas of research on machinery.

### ***Lubrication Services***

Proper lubrication is a key element in maintaining machinery health and life. A lubrication program optimizes the use of lubricants, resolves lubrication problems, and protects machinery against wear and premature failure. Actionable lubrication health information can be combined with vibration and performance information to improve the decision process. BNSES can help you implement a strategic lubrication program or set up and operate a program for you. Please see our article, "Lubrication – A strategic part of asset management," on page 6. BNSES can also provide resources to manage a plant-wide or company-wide program.

### ***Rotor Dynamics Research***

Some machinery problems require laboratory and/or field research projects to determine the fundamental cause. BNSES can coordinate the design of laboratories, simulators, and research projects, in conjunction with Bently Rotor Dynamics Research Corporation.

### ***Alignment***

When the fundamental cause has been determined to be misalignment, BNSES field engineers can provide laser

and optical alignment surveys under running conditions if necessary. They will determine proper alignment practices and provide recommendations for corrections.

### **Product care**

While our products don't fail very often, they do occasionally need service and repair. It's difficult for plant instrument engineers and technicians to maintain a high level of expertise. That's why it makes sense to use Bently Nevada's service engineers. We have 40 years of product care experience, and our service personnel are continually upgrading their training to enable them to troubleshoot all Bently Nevada products, from the oldest to the most recent releases. We can provide on-site help within 24 hours anywhere in the world in the local language. For some products, we can even provide remote service within minutes.

### **Bently Nevada Spare Parts Management**

If you are unsure what spares you need for your Bently Nevada products or don't want to stock spares yourself, let BNSES manage your spare parts program. We can minimize the spares you require on-site and fill most needs anywhere in the world in 24 hours.

### **Design and Documentation Services**

Sometimes projects are small and easily implemented by your plant personnel, but you don't have the time or the experience to do the electrical, mechanical, or system design or documentation. No job is too small, or too big, for BNSES.

Need a transducer bracket designed? Chances are we already have a design that will suit you. Even so, we will assure that it meets your particular application, that it meets industry best practice and has mechanical integrity. We are experienced specialists in retrofitting machines with proper transducers.

Need a well-designed and documented cabinet? Call on us. Bently Nevada can design and manufacture cabinets at competitive rates.

Need help documenting changes in your protection, management, control, or instrument systems? We are experienced in documenting engineering changes, both in hard copy and electronic format, to your specifications.

### **Training**

We have world-class training facilities all over the world, to provide entry-level and high-level courses taught in the local language. Courses cover product care, machinery

diagnostics, rotor dynamics, balancing, alignment, and how to get the most out of your Bently Nevada systems. We develop our training programs ourselves, working closely with Bently Nevada Engineering, Manufacturing, and Services, with the support of Bently Rotor Dynamics Research Corporation. Our courses provide a mix of theory, case histories, technology, and more hands-on labs than you'll find in any other program. If a standard course doesn't fit your needs, we'll engineer one specifically for you.

Can't travel to a training center? Try learning through our computer-based training programs.

Can't decide which seminar to attend right now? Purchase a training coupon valid for attendance at any one of our courses in any one of our centers.

Need training on-site on your machines or our systems? Our service engineers are trained to provide on-site courses.

Need certification? We have a certification process set up for each of our courses and will provide a comprehensive skills and knowledge test to certify you.

### **Financing**

Financing can be the most difficult part of a project. Bently Nevada Corporation can arrange financing to help you get the best value and timing for your project. Your Bently Nevada sales representative can provide additional information.

### **Summary**

As we've shown in this article, our service capabilities are extensive, and they are global. Because so many of you are outsourcing scope related to machinery protection and management activities and projects, we are continually growing our organization to meet your needs. In addition to our services, we offer a variety of financing options to ensure we have not only the capabilities you need, but the commercial terms and flexibility too. You can contact any of our more than 250 sales and service professionals worldwide to learn more. ☺